

Developing a Controlled Vocabulary for Education as a Health Care Intervention

Malinda Peeples, RN, MS, CDE
Johns Hopkins University School of Medicine
Division of Health Sciences Informatics

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Mentors: Olivier Bodenreider MD, PhD
Dina Demner-Fushman, MD

Objectives of Project

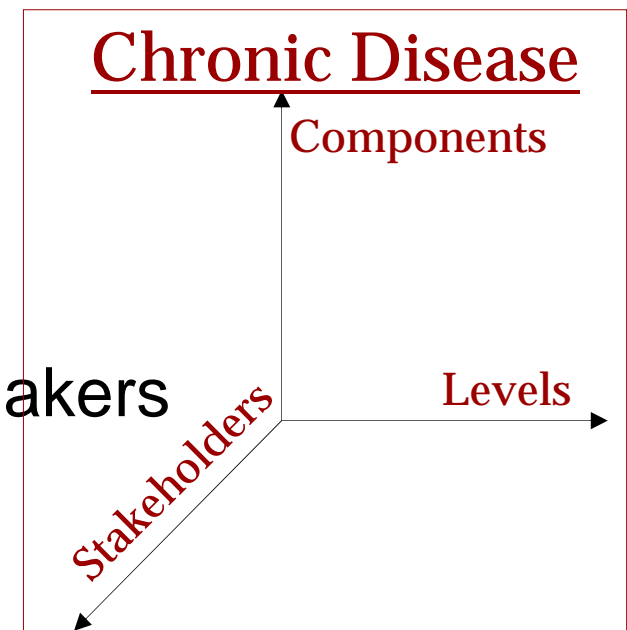
Investigate Two Approaches
for the Development
of a Controlled Vocabulary
for Education
as a Health Intervention
in Chronic Disease.

Chronic Disease in US

- ◆ Affects over 100 million people
 - 75% of the 1.4 trillion dollars of national health care expenditures (IOM report)
 - ◆ Patient self-management
 - is a cornerstone of chronic disease care
 - ◆ Patient education
 - is an intervention “that imparts knowledge, attitudes and skills with the specific goal of changing behavior, increasing compliance with therapy and, thereby, improving health.” (The Consumer and Patient Health Information Section of the Medical Library Association, 1996)
-

EDUCATION as an Health Intervention: A Systems View

- ◆ **Levels of care system**
 - ▶ Individual –provider or recipient of education
 - ▶ Program – organization of services for an entity
 - ▶ National – aggregate of programs
- ◆ **Components within each level**
 - ▶ Structure – organization of system components
 - ▶ Process - function of system
 - ▶ Outcomes – objective of system
- ◆ **Perspectives (stakeholders)**
 - ▶ Patient, Provider, Payer
 - ▶ Administrator, Regulators, Policy Makers

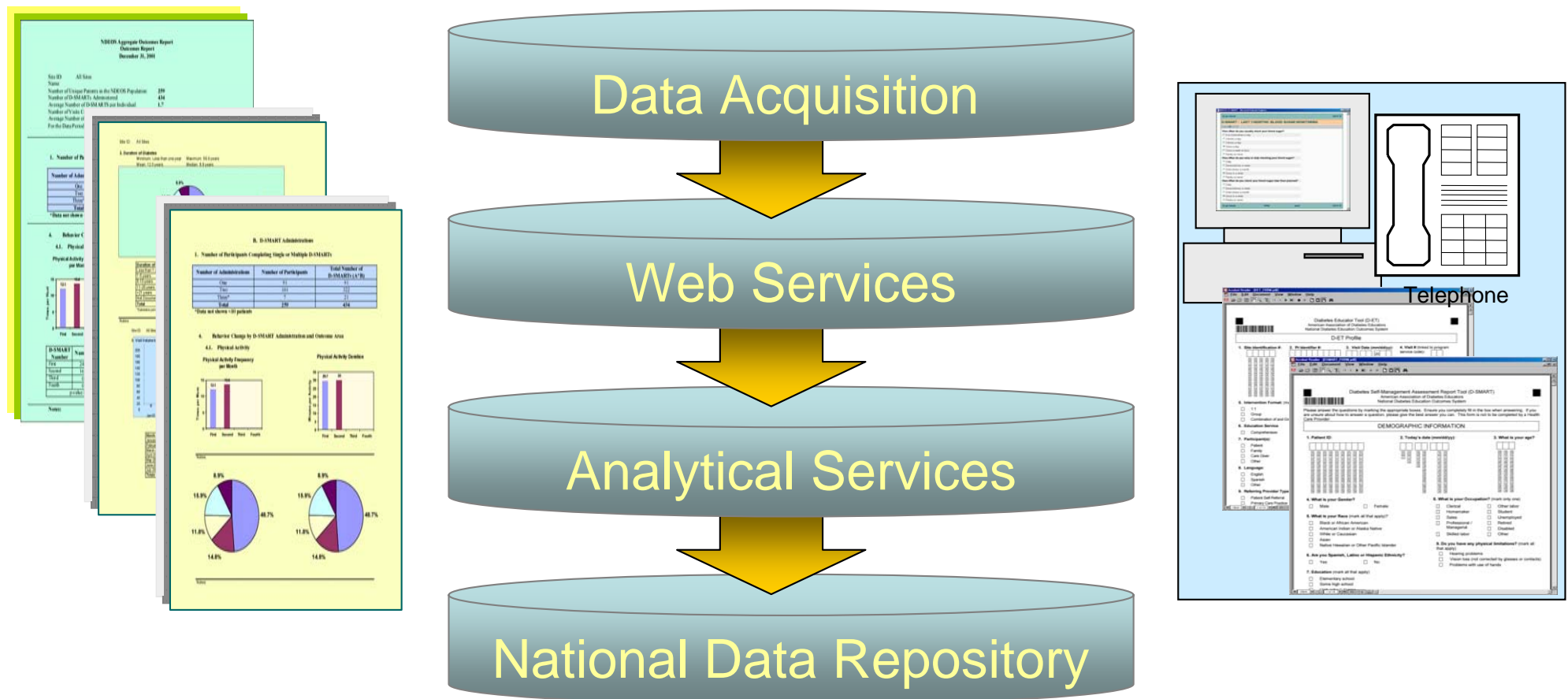


Problem

- ◆ What is the evidence that education is effective?
 - ▶ What settings, what dose, what frequency?
 - ▶ Which methods ?
 - ▶ Which providers ?
 - ▶ What are the key outcomes?
 - ◆ Poorly defined means that it is difficult to evaluate or measure outcomes
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A Solution: “10 year Project”

NDEOS Architecture



Hypothesis

A structured, controlled vocabulary of education as a health intervention will support:

- ▶ Electronic outcomes reporting
 - ▶ Literature indexing (evidence gathering)
 - ▶ Common approach to support patient-provider communication
 - ▶ Integration of education into the electronic medical record and other entities
-

Pilot Project: Test Vocabulary

- ◆ Purpose: To develop a controlled vocabulary to support *education program outcomes reporting*.
 - ◆ Scope: A Diabetes Self-Management Education (DSME) program is the use case and the *perspective* is that of the *program manager*.
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Methods

- ◆ UMLS: “Top-down”
explore the UMLS for concepts and relationships
 - ◆ MedLine: “Bottom up”
text-based searching of biomedical literature for concepts
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Methods: UMLS

1. Search the UMLS for concepts
 2. Manual review of the concepts
 3. Categorize the concepts
 4. Sort the concepts
 5. Obtain the hierarchical relationships
 6. Review the relationships for relatedness to vocabulary purpose
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UMLS: Search for Concepts

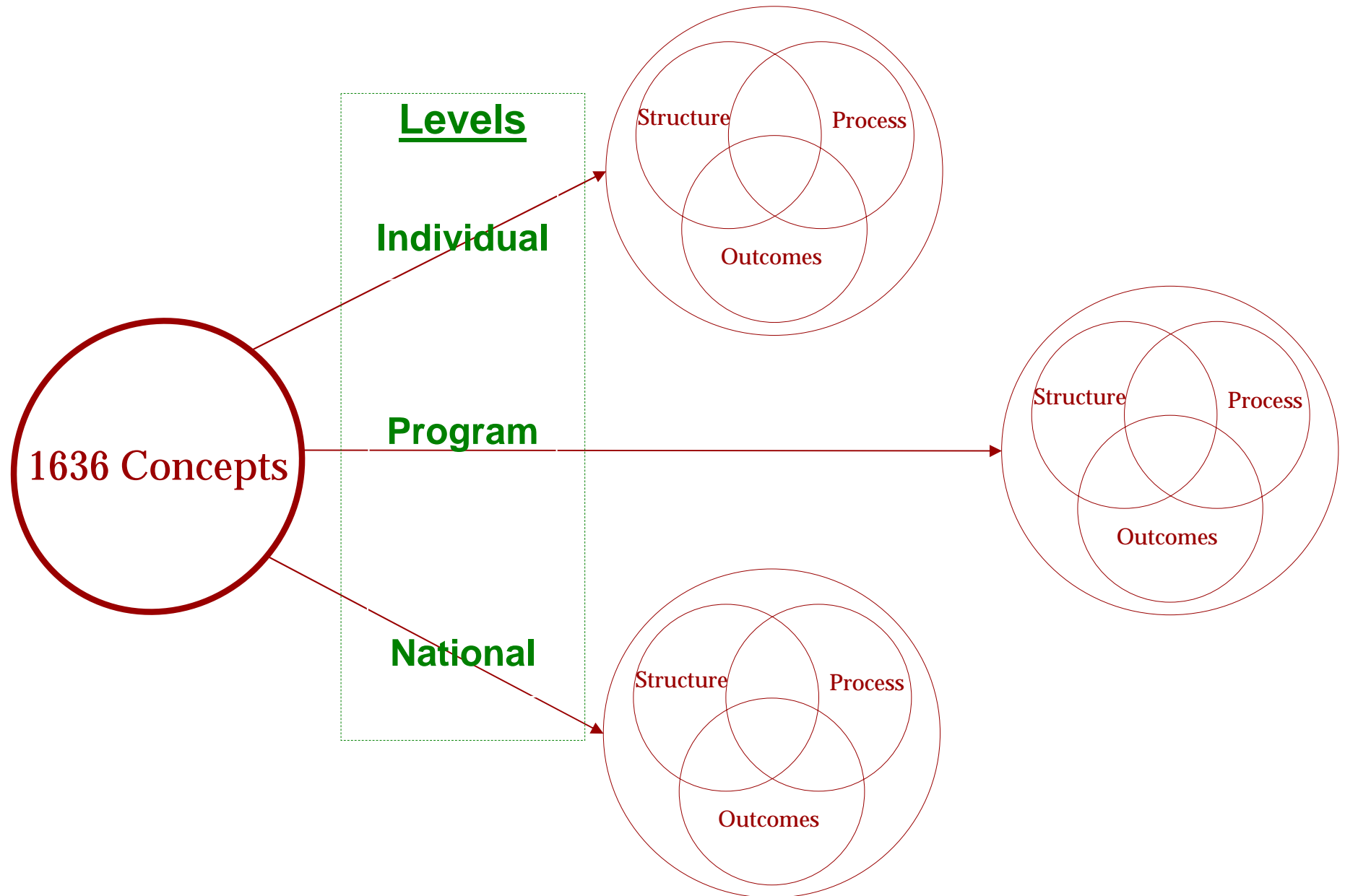
- ◆ Identified 26 candidate concepts
 - ▶ domain expert
 - ▶ perspective of DSME program manager
 - ◆ Mapped to UMLS
 - ▶ 16 seed concepts were identified
 - ▶ 2038 concepts found in hierarchical or associative relation
-

UMLS: Manual Review of Concepts

2038 concepts for relatedness to education programs

- ▶ Deleted 402 non-relevant concepts
 - ▶ Used semantic types for clarification - most common were *Health Care Activity* and *Educational Activity*
 - ▶ “Interesting” terms were archived for later review
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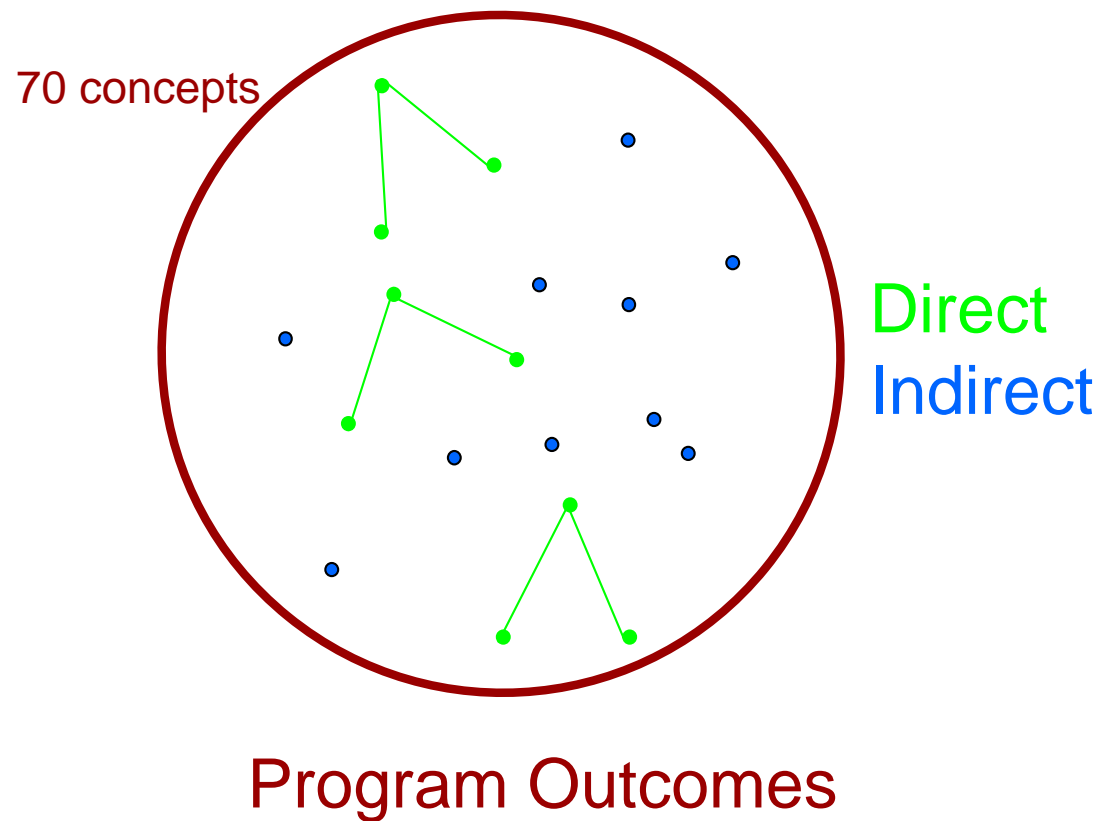
UMLS: Categorize concepts



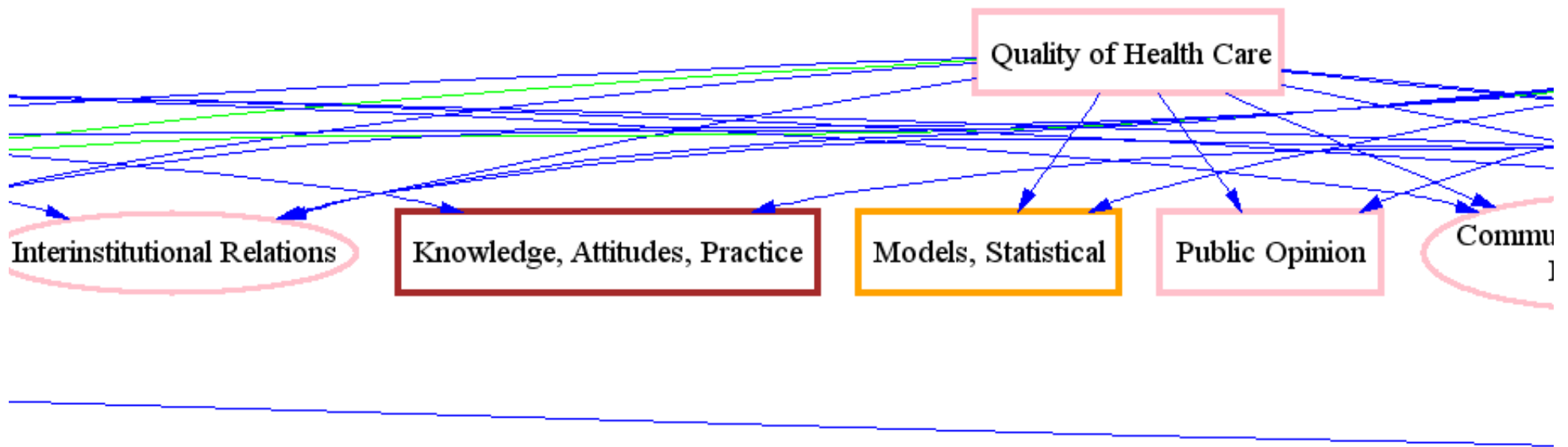
UMLS: Sort Concepts

<i>Levels</i>	Structure	Process	Outcomes
Individual	0	207	152
Program	76	122	70
National	11	27	62

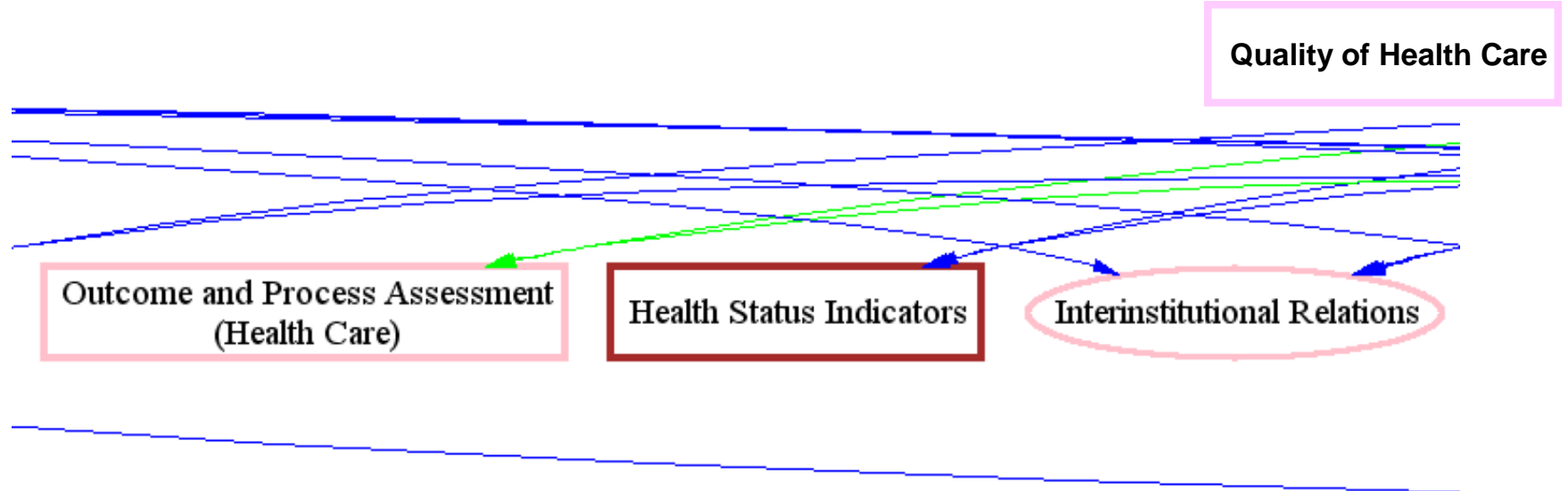
UMLS: Hierarchical Relationships



UMLS: Review Hierarchies



UMLS: Review Hierarchies



Medline: Text-based Approach

- ◆ Motivation: Biomedical literature is good source of concepts for a controlled vocabulary
 - ◆ Goal: To determine if this “bottom- up” method can assist with identification of missing terms for vocabulary
 - ◆ Results: A methodology and concepts to enhance the vocabulary -- especially at the “leaf level”
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Methods: Medline

1. Search SEE using key concepts
 2. Obtain relevant abstracts based on strings of text
 3. Markup abstracts using SPO framework
 4. Review for inclusion in vocabulary
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Medline: Search Concepts

Match Patterns

Search Doc: **Citation** Search Text 1: **Execute**

Search Area: **Everything Useful** Search Text 2:

Spread: Expansion: **Term**

Can Reverse: ☒

Searched all 6726780 citation docs. Found 901 hits in 760 docs.

Match Patterns:

	Hit Count	DocCount	Spread	Left Search Text	Insert Pattern	Right Search Text
502	1	1	2	outcome	of brittle	diabetes
503	1	1	4	outcome	in multivariate analysis included	diabetes
504	1	1	3	outcome	associated with gestational	diabetes
505	1	1	4	diabetes	: improvement of pregnancy	outcome
506	1	1	1	outcome	for	diabetes
507	1	1	4	outcomes	: effects of a	diabetes
508	1	1	4	outcomes	of the management of	diabetes
509	1	1	4	diabetes	patient education on patient	outcomes
510	1	1	4	outcomes	in young children with	diabetes
511	1	1	3	outcome	survey and the	diabetes
512	1	1	4	outcome	in association with lipotrophic	diabetes
513	1	1	2	outcome	of childhood	diabetes
514	1	1	3	outcome	(age,	diabetes


Drill Down **Get Docs** **Get Sentences**

Hit Contexts:

	Hit Count	Doc Count	Left Context	Left Search Text	Insert Tokens	Right Search Text	Right Context
259	1	1	insulin treatment and pennatar	outcome	in women with gestational	diabetes	metformin (garni)
260	1	1	weeks. the predesignated	outcome	was the odds of	diabetes	in metformin versus placebo
261	1	1	four preventive measures for	diabetes	care. main	outcome	measures: satisfaction with
262	1	1	effects of pioglitazone on	diabetes	-related	outcomes	in hispanic patients.
263	1	1	long-term clinical and economic	outcomes	of a community pharmacy	diabetes	care program.
264	1	1	an intramural competition on	outcome	of	diabetes	care.
265	1	1	be used as an	outcome	measure for	diabetes	clinical trials and research
266	1	1	have a better neurodevelopmental	outcome	and lower risk of	diabetes	if they are treated
267	1	1	glycaemic control but improve card...	outcomes	in type 2	diabetes	. multiple therapeutic targets
268	1	1	clinic for patients with	diabetes	could improve	outcomes	. although this approach appears
269	1	1	impact of	diabetes	mellitus on cardiac surgery	outcome	.
270	1	1	66) after diagnosis	diabetes	-related	outcomes	were measured, including each
271	1	1	between psychosocial variables a...	diabetes	-related	outcomes	in adults with newly diagnosed

Start | My Documents >> | My eBooks | 11:46 AM

Medline: Markup Abstract

 Doc XML Display

Doc 1 of 1 citation doc from: diabetes education and program outcomes [Everything Useful] AND INFLECT "long-term clinical and economic outcomes of a community pharmacy diabetes care program." [Everything Useful]

Process

Outcomes

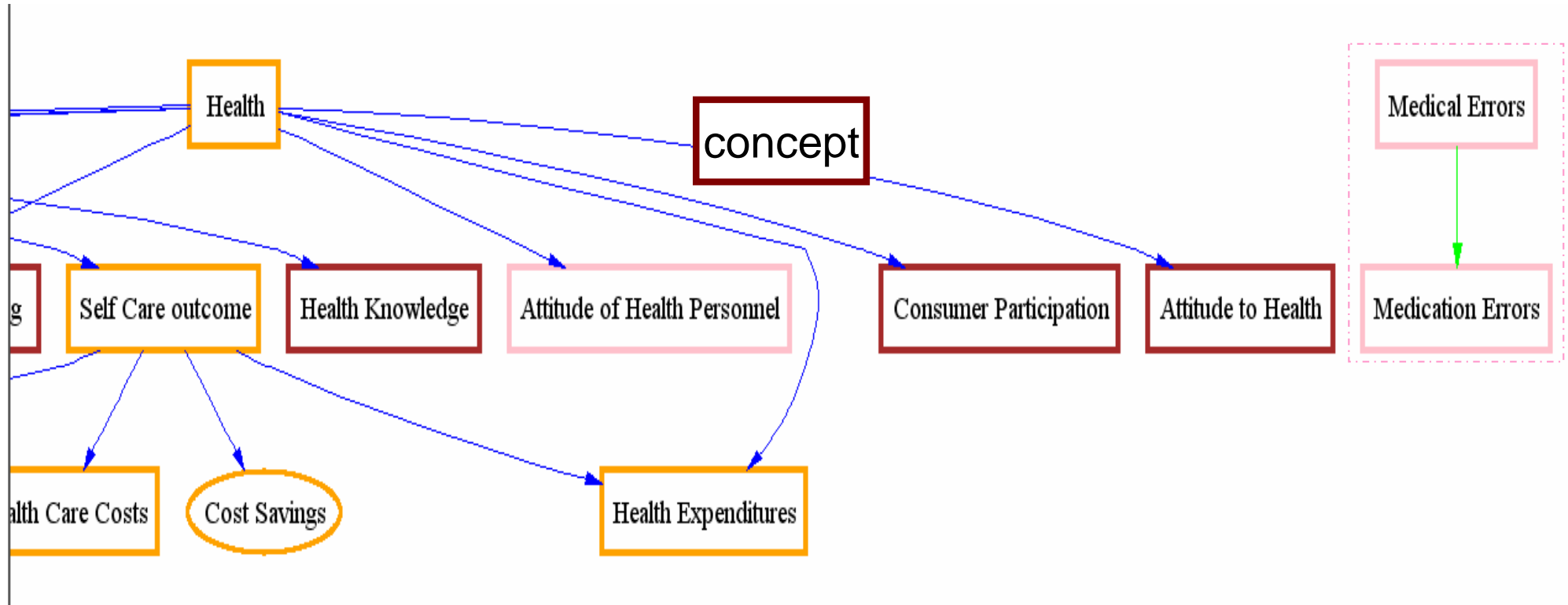
Structure

```
<Issue>2</Issue>
<PubDate>
<MedlineDate>2003 Mar-Apr</MedlineDate>
</PubDate>
</JournalIssue>
</Journal>
<ArticleTitle>The Asheville Project: long-term clinical and economic outcomes of a community pharmacy
diabetes care program.</ArticleTitle>
<Pagination>
<MedlinePgn>173-84</MedlinePgn>
</Pagination>
<Abstract>
<AbstractText>OBJECTIVE: To assess the persistence of outcomes for up to 5 years following the initiation of
community-based pharmaceutical care services (PCS) for patients with diabetes. DESIGN: Quasi-experimental,
longitudinal pre-post cohort study. SETTING: Twelve community pharmacies in Asheville, N.C. PATIENTS AND
OTHER PARTICIPANTS: Patients with diabetes covered by self-insured employers&apos; health plans. Community
pharmacists trained in a diabetes certificate program and reimbursed for PCS. INTERVENTIONS: Education by
certified diabetes educators, long-term community pharmacist follow-up using scheduled consultations,
clinical assessment, goal setting, monitoring, and collaborative drug therapy management with physicians.
MAIN OUTCOME MEASURES: Changes in glycosylated hemoglobin (A1c) and serum lipid concentrations and changes in
diabetes-related and total medical utilization and costs over time. RESULTS: Mean A1c decreased at all
follow-ups, with more than 50% of patients demonstrating improvements at each time. The number of patients
with optimal A1c values (< 7%) also increased at each follow-up. More than 50% showed improvements in
lipid levels at every measurement. Multivariate logistic regressions suggested that patients with higher
baseline A1c values or higher baseline costs were most likely to improve or have lower costs, respectively.
Costs shifted from inpatient and outpatient physician services to prescriptions, which increased
significantly at every follow-up. Total mean direct medical costs decreased by $1,200 to $1,872 per patient
per year compared with baseline. Days of sick time decreased every year (1997-2001) for one employer group,
with estimated increases in productivity estimated at $18,000 annually. CONCLUSION: Patients with diabetes
who received ongoing PCS maintained improvement in A1c over time, and employers experienced a decline in mean
total direct medical costs.</AbstractText>
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Evaluation

Structural Approach for completeness and consistency

- Hierarchical consistency – missing relations
- Missing concepts – indirect inheritance



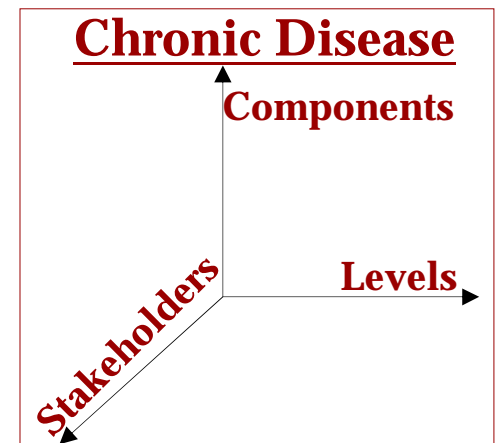
Evaluation

Quality -- Semantic properties

- ▶ Only a limited range of semantic types is expected to be found within each S-P-O group of concepts
 - ▶ Concepts with outlier semantic types should be reviewed
 - Program Outcome:
C0001811 Aging ... *Organism Function*
Temporal Concept
-

Future Work

- ◆ Completion of Education Program Vocabulary
 - Refine UMLS method
 - Meta Map and automation of concept extraction
 - EBM markup for PMOT for diabetes care
 - other stakeholder perspectives
- ◆ Evaluation of vocabulary by stakeholder groups
- ◆ Integration into NDEOS
- ◆ Apply methods to other chronic diseases such as asthma



Limitations

- ◆ Method is based on assumption that concepts exist in UMLS and biomedical literature
 - ◆ Other methods for completing vocabulary will need to be addressed
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Acknowledgements

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 - ◆ Tom Rindflesch, Ph.D.
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 - ◆ AADE Outcomes Project Team
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